

Initial	Date
JRB	8/21/80

SS/EN
Lake Andes NWR

AUG 21 1980

Memorandum

To: Refuge Manager, Lake Andes NWR
From: Acting Regional Engineer, Region 6
Subject: 1980 Annual Water Management Plan (AWMP)

Thank you for submitting your 1980 AWMP. It was one of the best we received - very professionally done. The information you provided will help to document beneficial use of water by the Service at Lake Andes National Wildlife Refuge.

The effort you put forth on this year's report is evident, so we extend our compliments. We're looking forward to your continued cooperation in this program.

(Sgd.) Donald G. Stewart

cc: Area Manager, Pierre
ARD-RAW, Region 6

EN:JBoudreaux:bt 8-21-80

cu

ANNUAL WATER MANAGEMENT

Plan

Lake Andes National Wildlife Refuge

Lake Andes, South Dakota

Prepared by GARY R. Zahm by James R. Good
Refuge Manager

3-26-80
Date

Reviewed by James R. Good
Refuge Biologist

4-25-80
Date

Concurrence

John W Koerna
Acting Assistant Area Manager (RW)

7/24/80
Date

Approval

Edward G Peterson
Acting Area Manager

7-24-80
Date

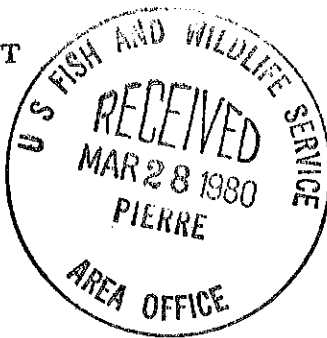
Concurrence

Regional Engineer

Date

UNITED STATES GOVERNMENT

Memorandum



DATE: March 26, 1980

TO : Area Manager (ARW)
Pierre, SD

FROM : Complex Manager
Lake Andes, SD

SUBJECT: Annual Water Management Plan - 1980

Handwritten: Good.

Due to the complicated history of water rights at Lake Andes, plus the changeover in management objectives since DVE, I've put together a more elaborate history than is probably required for the annual report; however, the information contained in the plan should prove beneficial to subsequent refuge managers and their assistant.

Handwritten signature: Lay R. Zahn

GZ/ld



ANNUAL WATER MANAGEMENT PLAN, 1980

A. Background and General Water Use - Lake Andes

The Fish and Wildlife Service has two water rights of record authorizing the appropriation of water for use in the Lake Andes National Wildlife Refuge. The first is U. S. Withdrawal No. 517-3 which pertains to the storage and management of water in Lake Andes and to a small diversion system to divert runoff from an additional 2560 acres of drainage into the southern portion of Lake Andes via Garden Creek. U. S. Withdrawal No. 517-3 reserves *from original application* 20,359 acre-feet of water from all tributaries of Lake Andes.

*at max. rate
of 100 cfs*

The water supply for Lake Andes comes entirely from runoff from an 84,800 acre watershed, with the main tributary being Andes Creek which terminates at the north end of Lake Andes. Other than an existing artesian well at the Rest Haven Resort (south unit) plus periodic water supplements from Owens Bay, annual runoff (through snow melt or periodic rainfall) supplies the only water source to Lake Andes.

Lake Andes is an extremely productive lake for fish, waterfowl and water-related aquatic birds when water supplies are adequate. Optimum waterfowl production and associated macro-invertebrate and submergent food supplies are produced during the periods of less-than-optimum water levels. Given the aforementioned conditions, Lake Andes can be annually expected to

*State
certificate:
13,721 AF
storage +
6813 AF
seasonal
totals
20,534 AF
priority date
4/22/40
Filing for
north + south
units only
although FWS
policy must be
that State
WR covers
all of lake.*

produce 20,000 ducks and 30,000 coots, while as many as 100,000 ducks and 40,000 geese (both Canada and Snow) may use the lake during Fall migration. During the Spring and Summer months, countless numbers of birds use the lake for both resting and feeding.

Water management by U. S. Fish and Wildlife Service personnel on Lake Andes is almost nonexistent, mainly because of the existing easement with South Dakota which grants, "the exclusive and perpetual right and easement to flood with water, and to maintain and operate an artificial lake. . . . for water conservation, drought relief, and for migratory bird and wildlife conservation purposes, and/or upon said lands and waters to operate and maintain a wildlife conservation demonstration unit and a closed refuge and reservation for migratory birds and other wildlife". Because of the less-than-predictable annual runoff condition necessary to raise or maintain water levels, plus the extreme local citizen sentiment relating to the need for recreational facilities on the lake, the Service has traditionally let Mother Nature control the water levels.

Being a prairie lake, the periodic desiccation-inundation associated with historic dry-wet cycles provide maximum benefits to both fish and wildlife resources without man's artificial interference. Unless an artificial, dependable source of water for Lake Andes becomes available, therefore allowing for beneficial periodic draw-downs, based upon biological reasoning, the current policy of holding as much water as possible with no water level manipulation between the three units, must be continued.

With the 1922 establishment, via Congressional action, of an artificial outlet structure (1437.25 S. L. elevation) for Lake Andes, therefore effectively lowering the historic high water level of the lake by 13-feet, plus the increased demand by private irrigators for water within the upper level aquifer flows (0-240 feet), for which Lake Andes contributes greatly, the historic remembrances of Lake Andes as a permanent body of deep blue water, replete with stern-wheel tourist boats and fantastic bass fishing, are unfortunately, a thing of the past.

B. Background and General Use - Lake Andes Owens Bay

An executive order, signed by President Franklin D. Roosevelt on February 14, 1936, established the initial 365 acres (later known as the Owens Bay Unit of the Lake Andes NWR) of the Lake Andes Migratory Waterfowl Refuge. These 365 acres were reserved and set apart for use as a refuge and breeding ground for migratory birds and other wildlife. During subsequent years, an additional 467 acres were purchased and the Owens Bay Unit was created.

The original, primary management objectives for Owens Bay were established to provide a wintering area, a migrational rest stop and a wildlife production area, in that order. Over 350 acres of uplands surrounding Owens Bay were farmed for flocks of as high as 200,000 ducks and 40,000 Canada geese which overwintered in the Bay.

To facilitate water management on Owens Bay, the Fish and Wildlife Service, on July 6, 1956, submitted an application to the state to drill an artesian well to produce 2.22 cfs (1000 gpm)

original
meander line
was elev.
1433.25 msd

Permit No.
220-3

of water for fish and wildlife management. This application was approved and issued on December 31, 1956, with a completion of work being submitted by the Service's Regional Engineer on April 3, 1958.

The Owens Bay well was drilled in 1957, producing an open flow of 1000 gpm. Following the 1957 installation of a 10 inch valve at the well head, the flow was reduced to 750 gpm. A casing blow-out occurred during a well shut-in following the 1973 DVE outbreak. After an 8 inch liner was installed, the resulting 450 gpm flow has remained stable as of this date.

In October, 1978, a replacement well was drilled by Huron Drilling, 200 feet north of the existing well. By early November, drilling had continued to the 933.5 foot level, the last 6.5 feet being into the basement rock foundation of Sioux quartzite. Because of the lack of water, the order to abandon was given by the Regional Engineer.

Following the tragic January, 1973 die-off of an estimated 30-40,000 ducks and geese which had wintered in the open water (created by the free-flowing well) at Owens Bay, the objective of holding large flocks of waterfowl throughout the winter was abolished.

During the next 5 years, the 300-plus acres of croplands were reseeded to native grass nesting cover and the artesian well was shut off during the November-February period; therefore

eliminating the water source for the ducks and geese. Unfortunately, the minimal 450 gpm flow could not keep pace with annual transpo-evaporation losses and by 1977, the 280 acre Owens Bay marsh had shrunk to a 40 acre mudhole!

During the 1970-75 period, a small (40 acre) pond complex was constructed, utilizing the water from the artesian well to maintain levels. Unfortunately, the lack of over-all water depth within this complex caused a near-total take over by cattail; therefore eliminating waterfowl production benefits.

A BLHP construction-rehabilitation project was initiated in 1978 to deepen the pond complex, rehab the dikes and control structure, construct nesting and loafing islands, plus rehab the artesian well's water delivery system.

Current water management of the Owens Bay Unit can be delineated in the following manner: entire well flow diverted into the North prairie pond during late February; complete inundation of the ponds completed in approximately $4\frac{1}{2}$ weeks; continuous flow through pond complex and into Owens Bay via the south pond control structure; pond complex water levels dropped 6 inches in late June, then held stable until height of Fall waterfowl migration; pond levels dropped slowly in early October to expose submergent vegetation and macro-invertebrate populations; well flow diverted directly into Owens Bay prior to freeze-up; continuous well flow into Owens Bay until the late February diversion. It is unfortunate that the 1978 replacement well failed. Because of insufficient water flows needed to refill

the Owens Bay marsh, periodic draw-downs cannot be accomplished without causing habitat degradation.

Following the completion of this valuable pond complex, plus the decision to allow the free flowing artesian water to remain diverted into Owens Bay during the winter months (thus making up the majority of the summer's transpo-evaporation losses), the population once again has access to a permanent, biologically acceptable marsh complex consisting of over 300 surface acres.

C. Water Use-1979 -- Lake Andes

Runoff via the Lake Andes tributary system was nearly nonexistent during 1979. If it had not been for a near average rainfall year, the water levels would have been more drastically affected. The following table lists periodic water level readings made during 1979:

Table 1. Water Level Readings -- Lake Andes

GAUGE READINGS			
<u>DATE</u>	<u>NORTH</u>	<u>CENTER</u>	<u>SOUTH</u>
3/6	1435.58	1430.90	1429.70
3/22	1436.80	1431.20	1429.70
4/3	1436.80	1431.20	1429.70
4/10	-	1431.25	1429.68
5/1	1436.56	1431.30	1429.69
5/11	1436.52	1431.35	1429.75
5/21	1436.54	1431.32	1429.65
5/29	1436.40	-	-
6/18	1436.28	1431.23	1429.49
7/26	1435.70	1430.89	1429.26
9/24	1434.88	1430.28	-
11/10	-	1430.22	-

Current spillway crest elevations are as follows: North - 1436.35; Center - 1434.85; South - 1436.75. Current pool bottom elevations are as follows: North - 1429.25; Center - 1427.00; South - 1426.00.

Adherence to the established Lake Andes water management plan (that is, hold as much water as possible up to 1437.25) depends entirely upon 1980 runoff into the lake; therefore, progress towards final objectives will be inadequate.

D. Water Use - 1979 - Owens Bay

Although Spring runoff into Owens Bay was nonexistent, periodic rainfall and less-than-average evaporation allowed the free flowing artesian well to reach and maintain planned water levels on both the Owens Bay marsh and the Prairie Pond Complex. Table 2 portrays water level fluctuation in Owens Bay.

Table 2 Water Level Readings - Owens Bay, 1979

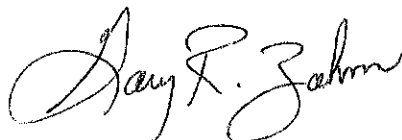
<u>DATE</u>	<u>GAUGE READING</u>
3/6	1442.30
3/22	1442.43
4/10	1442.58
5/1	1442.42
5/11	1442.32
5/21	1442.36
5/29	1442.12
7/9	1441.92
7/26	1441.72
9/24	1440.92

Current respective spill^{way}well crest and pool bottom levels are: 1442.42 and 1436.52.

During 1979, the Owens Bay artesian well produced approximately 726 acre-feet of water. Unless aquifer levels (contained within the Dakota sandstone) experience a rapid depletion, or unless a major well maintenance/repair problem develops, the existing annual well flow will be sufficient to maintain levels. Unfortunately, years with above-average temperature, wind velocities, plus below-average precipitation will play havoc with management objectives. For this to happen would spell disaster to one of the best waterfowl production units in the United States.

Due to the total lack (as of 3/14/80) of runoff into Owens Bay, it appears that the only major water inflow during 1980 will come from the artesian well. The well flow was diverted into the north Prairie Pond on 2/26 with the expected management levels to be reached on or about 3/28. With the current water level of Owens Bay being 1441.82, it is expected that the 1980 management level of the Bay will also be reached; however, extreme weather condition could cause losses which could not be made up by the existing output of the artesian well.

It might also be added that the decision to allow the artesian well to flow into Owens Bay during the winter months (even though some man-hours must be expended for the dispersion of wintering waterfowl) adds at least 182 acre-feet of water into the Bay. This annual replenishment may be the key to waterfowl production figures experienced in 1979 (2100 ducks produced).



LAKE ANDES NATIONAL WILDLIFE REFUGE
AREA-CAPACITY TABLE
for
NORTH UNIT (Unit 3)

<u>Elevation</u> <u>(msl)</u>	<u>(assumed)</u>	<u>Capacity</u> <u>Acre-Feet</u>	<u>Difference</u> <u>in Capacity</u>	<u>Area</u> <u>Acres</u>	<u>Diff. in</u> <u>Area</u>
1429.25	92	0		0	
1430.25	93	21	21	42	42
1431.25	94	106	85	128	86
1432.25	95	300	194	260	132
1433.25	96	626	326	392	132
1434.25	97	1,055	429	466	74
1435.25	98	1,548	493	520	54
1436.25	99	2,093	545	570	50
1437.25	*100	2,683	590	611	41
1438.25	101	3,312	629	647	36
1439.25	102	3,975	663	680	33

*100.0 = Original Water Right Filing elevation.

Note: Current spillway crest (North-Center Units) = 1436.35 elev.

Planimetered from Solberg's contour map by RWD 6/15/45
ratypad 2/25/64 CWS

See Dwg. 3R-So.Dak.-173-6

LAKE ANDES NATIONAL WILDLIFE REFUGE
AREA-CAPACITY TABLE
for
SOUTH UNIT (Unit 1)

<u>Elevation</u> <u>(msl)</u>	<u>(assumed)</u>	<u>Capacity</u> <u>Acre-Feet</u>	<u>Difference</u> <u>in Capacity</u>	<u>Area</u> <u>Acres</u>	<u>Diff. in</u> <u>Area</u>
1426.25	89	0		0	
			541		1082
1427.25	90	541		1,082	
			1,206		248
1428.25	91	1,747		1,330	
			1,395		130
1429.25	92	3,142		1,460	
			1,492		65
1430.25	93	4,634		1,525	
			1,547		45
1431.25	94	6,181		1,570	
			1,587		35
1432.25	95	7,768		1,605	
			1,621		33
1433.25	96	9,389		1,638	
			1,649		22
1434.25	*97	11,038		1,660	
			1,673		27
1435.25	98	12,711		1,687	
			1,704		35
1436.25	99	14,415		1,722	
			1,744		45
1437.25	100	16,159		1,767	
			1,789		45
1438.25	101	17,948		1,812	
			1,831		39
1439.25	102	19,779		1,831	

*97.0 = Original water right filing elevation.

Note: Current spillway crest (South-Center Units) = 1434.85 elev.

Planimetered from Solberg's contour map by RWD 6/15/45
retyped 2/25/64 GWS

See Dwg. SR-So.Dak.-173-4 & 173-5